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THESIS

HAZARDOUS WASTE REDUCTION EFFORTS
OF THE NAVY AND DoD IN THE
SAN DIEGO CALIFORNIA REGION

by

Michael W. Kane

December, 1993

Thesis Advisor:

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94-07370



DTIC QUALITY INSPECTED 3

94 3 4 024

Unclassified

Security Classification of this page

REPORT DOCUMENTATION PAGE

1a Report Security Classification: Unclassified		1b Restrictive Markings			
2a Security Classification Authority		3 Distribution/Availability of Report Approved for public release; distribution is unlimited.			
2b Declassification/Downgrading Schedule					
4 Performing Organization Report Number(s)		5 Monitoring Organization Report Number(s)			
6a Name of Performing Organization Naval Postgraduate School	6b Office Symbol (if applicable) 36	7a Name of Monitoring Organization Naval Postgraduate School			
6c Address (city, state, and ZIP code) Monterey CA 93943-5000		7b Address (city, state, and ZIP code) Monterey CA 93943-5000			
8a Name of Funding/Sponsoring Organization	6b Office Symbol (if applicable)	9 Procurement Instrument Identification Number			
Address (city, state, and ZIP code)		10 Source of Funding Numbers			
		Program Element No	Project No	Task No	Work Unit Accession No
11 Title (include security classification) HAZARDOUS WASTE REDUCTION EFFORTS OF THE NAVY AND DoD IN THE SAN DIEGO CALIFORNIA REGION					
12 Personal Author(s) Kane, Michael Walter					
13a Type of Report Master's Thesis	13b Time Covered From To	14 Date of Report (year, month, day) 1993 December		15 Page Count 55	
16 Supplementary Notation The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.					
17 Cosati Codes		18 Subject Terms (continue on reverse if necessary and identify by block number) Hazardous waste - DoD, Hazardous waste - Navy, Hazardous waste - San Diego, Hazardous waste disposal costs, Hazardous waste treatment technology.			
19 Abstract (continue on reverse if necessary and identify by block number) This research investigates the hazardous waste reduction efforts of the Department of Defense and the Navy in the San Diego, California region. It shows that previous efforts to reduce cost and generated waste have not been successful. The study reveals that efforts by Fleet Industrial Supply Center, San Diego should reduce both costs and wastes and that the improvements in the pricing schedule used by Public Works Center, San Diego to charge for hazardous waste processing services also should reduce costs. The research concludes that the best method to reduce costs is to reduce the waste stream. Further, more effort is needed to identify less or non-hazardous substitutes and waste treatment technologies should be investigated and implemented wherever possible.					
20 Distribution/Availability of Abstract <input checked="" type="checkbox"/> unclassified/unlimited <input type="checkbox"/> same as report <input type="checkbox"/> DTIC users		21 Abstract Security Classification Unclassified			
22a Name of Responsible Individual L. R. Jones		22b Telephone (include Area Code) (408) 656-2482		22c Office Symbol AS/JN	

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OF THE NAVY AND DoD IN THE
SAN DIEGO CALIFORNIA REGION

by

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Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL

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ABSTRACT

This research investigates the hazardous waste reduction efforts of the Department of Defense and the Navy in the San Diego, California region. It shows that previous efforts to reduce cost and generated waste have not been successful. The study reveals that efforts by Fleet Industrial Supply Center, San Diego should reduce both costs and wastes and that the improvements in the pricing schedule used by Public Works Center, San Diego to charge for hazardous waste processing services also should reduce costs. The research concludes that the best method to reduce costs is to reduce the waste stream. Further, more effort is needed to identify less or non-hazardous substitutes and waste treatment technologies should be investigated and implemented wherever possible.

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DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification _____	
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Distribution / _____	
Availability Codes	
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I. INTRODUCTION

A. OVERVIEW

Federal governmental intervention into the area of environmental regulation came to fruition with issuance of Executive Order 11472 in May 1969, to establish the Environmental Quality Council and the Citizen's Advisory Committee on Environmental Quality. These two organizations provided the nation with legislation that was enacted into law on 1 January 1970 as the National Environmental Policy Act (NEPA) [42 USC 4321, 32 CFR 775]. NEPA provided the nation with its first significant, official environmental policy. Since then, substantial additional legislation and regulations have been enacted to protect our environment and natural resources.¹

Although mandated by NEPA to consider environmental effects of proposed action in their decision making process, the Department of Defense (DoD) routinely went about its business with widespread disregard of environmental concerns for a considerable period of time. It was not until Executive Order 12088 was issued in October 1978, directing the heads of all Executive agencies to become environmentally responsible,

¹Appendix A lists all acronyms used in this research. Appendix B lists all pertinent environmental regulations.

that DoD officials were forced to start to act in an environmentally responsible manner. Further, flagrant nonchalance toward federal, state and local Environmental Protection Agency (EPA) regulations by DoD prompted intense congressional interest and intervention. This has forced the hands of DoD officials to abide by strict fiscal and procedural processes toward these efforts.

B. OBJECTIVE

DoD activities have increased awareness and responsibility for environmental damage caused by years of negligence and abuse in the handling and treatment of hazardous and toxic waste material. Numerous proactive and reactive responses to control, correct and establish responsible measures to preserve and protect the environment have been established. Unarguably, these steps were necessary but, they have created skyrocketing costs that must be addressed by DoD and Navy financial managers.

This thesis will examine these concerns and the efforts that have been undertaken in the San Diego, California region to reduce hazardous and toxic waste, and material generation and abatement. This is a large metropolitan area with several Naval facilities and other producers of hazardous and toxic waste and material. As with DoD facilities, each of these generators is mandated by statute to handle and process these contaminants.

C. RESEARCH QUESTIONS

The questions addressed by this research include: What efforts have been effected by DoD and some of its various entities to achieve environmentally sound practices in the San Diego, California area? To what extent have these efforts combated the spiraling costs associated with hazardous and toxic waste, and material management? Are there any other means available to reduce proliferation of these materials or the costs of disposal and treatment?

D. SCOPE

This research will provide a comprehensive assessment of current efforts in the San Diego, California area to control the costs associated with the generation and processing of hazardous and toxic waste and material. It will identify the wastes generated and associated handling costs. It also will examine efforts and technologies that may be exploited to further control costs.

E. LITERATURE REVIEW AND METHODOLOGY

Research and data collection will be limited to Naval facilities in the San Diego, California area. Existing data on the volume and types of material generated will be collected and analyzed as will the costs incurred to process and treat this material. Interviews with instrumental organizations and personnel actively involved in hazardous

waste processing and abatement in DoD and this geographic region will be conducted.

F. CHAPTER OUTLINE

Chapter II will provide a background presentation on DoD policy, Defense Logistics Agency (DLA) actions, Public Works Center (PWC), San Diego, California policy and actions, and Fleet Industrial Supply Center (FISC), San Diego, California actions. The third chapter will present data and analysis for waste streams and associated costs, hazardous material and waste minimization efforts, and available hazardous waste treatment technology. Chapter IV provides a summary, conclusions, and areas for further research.

II. BACKGROUND

We are, according to everything that I read, in the decade of an environment. The mission, as I see it, of the Armed Services Committee and this panel is to try to put balance into what we think is going to be kind of a feverish-type project for the next decade, to move things probably a lot faster than is possible, but the mission that we also have is to speed things up from where they are right now. [Ref. 1]

These words of the Honorable Richard Ray, Representative from Georgia, Chairman, Environmental Restoration Panel of the House of Representatives, Committee on Armed Services, spoken in April 1990, reflect the continued interest of Congress in DoD environmental matters that still persists today. This chapter will lay the background of what certain entities within this arena have undertaken to support sound environmental practices DoD wide and in the San Diego, California region.

A. DEPARTMENT OF DEFENSE POLICY

Military installations have long been engaged in operations dealing with hazardous and toxic wastes, and materials due to the very nature of their mission. These include such things as weapons, munitions, gases, pesticides, defoliants, fuels, lubricants, paints, and paint removers, cleaners, degreasers, hydraulic fluids, contaminated sludge, and acids. Many of these materials contain heavy metals,

volatile organic solvents, and other toxic chemicals which have been found to cause cancer, birth defects, and other health hazards to humans and to the environment if improperly handled, stored and disposed. [Ref. 2]

The most widely accepted and endorsed waste minimization method is source reduction. That is, any activity that reduces or eliminates the generation of a hazardous or toxic waste within a process, such as industrial production, repair, and maintenance processes. Other means also included are: better management of hazardous materials, recycling, reuse, and treatment of hazardous wastes to render them inert. [Ref. 3]

Responding to the Hazardous and Solid Waste Amendments of 1984, which required all hazardous waste generators to have minimization programs, DoD delegated responsibility for developing and implementing such programs to the individual Service Departments. This responsibility was again, formally delegated to the services by the Deputy Assistant Secretary of Defense (Environment) (DASD(E)) in a February 1987, policy letter. [Ref. 3:pp. 2,11]

Responding to the delegation of responsibility to the services that occurred in 1984, the Joint Logistics Commanders (Commanders of the Army Materiel Command, Air Force Logistics and Air Force Systems Commands, and the Deputy Chief of Naval Operations (Logistics)) developed a minimization program to provide the services with the basic concepts and requirements

of a hazardous waste minimization program. This program was to be utilized by the services in designing programs to fit their specific needs. The DASD(E) policy letter of 1987 drew upon the tenets of the Joint Logistics Commanders program and further outlined a minimization program that included:

- Reviewing all existing technology.
- Assessing existing technology being used at activities.
- Accurately reporting hazardous waste.
- Controlling hazardous waste materials.
- Developing command reduction goals and monitoring progress toward achieving them.
- Establishing hazardous waste minimization as an important consideration in all acquisitions. [Ref.3:p. 11]

1. Department of the Navy

As with DoD in general, Navy was slow to respond to the growing interest and legislative actions associated with environmental responsibility. Various superficial efforts were enacted to bring about process changes, material substitutions, and recycling but they were met with equally superficial responses by commands and installations. These efforts probably were doomed to fail because they lacked the key aspects necessary for any strategy to succeed. Namely, they did not assign clear accountability and responsibility, and they lacked goals.

Finally, on May 18, 1988, Navy issued a formal hazardous waste program that established roles and

responsibilities for major commands and activities. Additionally, using the weight of hazardous waste generated in 1987 as a benchmark, it set a Navy wide goal to reduce hazardous waste generated by fifty percent by the end of 1992. Also included in this directive was a requirement that the acquisition process for all weapons and support systems consider hazardous waste minimization. Each major command was directed to support this plan by:

- Implementing the entire program at their shore activities.
- Monitoring minimization goals.
- Substituting less hazardous materials for presently used hazardous materials.
- Evaluating new processes, process changes, facilities, and weapon systems to determine ways for minimizing the use of hazardous materials as much as possible. [Ref. 3:p. 15]

This plan was nearly an exact replication of the DoD program. Most major commands have enacted compliance to this program by further delegating the responsibilities to subordinate commands. What this has done then is caused myriad programs throughout the Navy, major commands, and even in the same geographic areas. There surely are commonalities but the fact is that each command is different because the Commanding Officer of each individual command is ultimately responsible for signing the EPA site permit and for compliance with all EPA regulations and infractions.

These efforts slowly brought about positive changes in hazardous waste management but the pace was slow and probably was not at an optimal level. Up to this point, the only impetus for compliance was the threat of the base commander receiving a notice of violation or fine for non-compliance from EPA. Starting in 1990 however, base commanders were tasked with financial responsibility for environmental compliance. That is, they now had to budget for hazardous waste management. This intensified awareness of procedural and management deficiencies to a new level.

B. DEFENSE LOGISTICS AGENCY ACTIONS

Prior to the 1980 amendment to the Resource Conservation and Recovery Act (RCRA) the individual services were responsible for final disposition of hazardous materials and wastes. As a result of the amendment, the Office of the Secretary of Defense (OSD) shifted this responsibility to DLA. Previously, DLA was primarily only involved in reutilization and sales of hazardous materials. Since environmental regulations were becoming more and more complicated, and were ever increasing, this was a logical move on the part of OSD. It basically tasked one organization to be actively involved with the myriad factors involved with safe and economical disposal and reutilization of hazardous wastes and materials. [Ref. 1:p. 4]

DLA implemented their efforts through their regional activities known as Defense Reutilization and Marketing Service (DRMS) and through their field activities known as Defense Reutilization and Marketing Offices (DRMO). On a very simplified level, the process used by DLA is to find another DoD activity that can reuse the material, find a buyer for the material provided it is in satisfactory condition or dispose of the material in an environmentally safe manner through use of service contracts. Whether issued, sold or contracted for ultimate disposal, hazardous wastes are only released to agencies, individuals or commercial organizations that are permitted by EPA to receive and handle such property. [Ref. 1:pp. 4-5]

Hazardous materials as defined by DLA are any item which has special characteristics which could cause harm to personnel or the environment if used or stored improperly, and must be ultimately disposed of as hazardous waste [Ref. 1:p. 14]. If the materials cannot be placed by reutilization within DoD, transferred to another federal agency or sold to the public, then it is treated as hazardous waste.

Certain categories of material are prohibited from any screening or sales cycles and are processed directly to ultimate disposal. Some are precluded from sale by law, such as PCBs, cancelled/suspended pesticides, and items containing friable asbestos. Other items have no sale value, such as spill residue, hardened paints, used items, and items in

leaking, rusted, or heavily dented containers. These items are identified as "by-pass" items and are exempt from the screening and sales cycles. [Ref. 1:pp. 14-16]

Defense Logistics Agency management of hazardous materials came under great scrutiny during the 1980's because of press reports critical of its program to resell hazardous materials to private parties. In a number of instances, these buyers did not handle the hazardous materials in a responsible manner and significant environmental damage resulted. Allegations were made that DLA was seeking to minimize DoD's hazardous waste disposal requirements by selling hazardous materials to unwitting outside parties. Further, it was found by the DoD Inspector General that DLA did not always have effective control and visibility over the hazardous waste that had been turned in, removed and disposed of. [Ref. 1:p. 2]

The problems encountered by DLA were partly generated through their own fault, but some other factors beyond their control helped to exacerbate the situation. Procurement of excessive amounts of hazardous materials by DoD activities and their subsequent non-use before expiration of shelf life caused too much of this material to be turned over to DLA for resale or disposal. Additionally, it was found by the DoD Inspector General that DoD generators do not adequately identify waste when it is turned over to DLA for disposal. The generators are required to complete waste profile sheets prior to turning in their waste to DRMO for disposal. In

cases where they have insufficient in-house knowledge to complete the profile sheet, they are to furnish a laboratory analysis that is available through DLA's Defense Industrial Supply Centers. Lastly, DLA was having difficulty dealing with qualified contractors. The biggest problem with contractors was the unwillingness of the most qualified contractors to bid for the service contracts because of the known inadequacy of DoD generators regarding proper identification of hazardous materials. [Ref. 1:pp. 2-4, 23-24]

To combat these growing problems and concerns, DRMS officials took initiatives to exercise greater control over what is sold and to whom it is sold. They have employed the use of annual requirements contracts that stipulate the removal time frame for disposal to be no more than 30 days from issuance of the disposal order. Use of interim, one-time contracts is limited to only cover extended lapses in negotiating new annual contracts. The contracts require the contractors to identify in advance, transportation and any treatment, storage and disposal facilities they will use. DRMS evaluates contractor past-performance, proposed subcontractors, EPA and state permits and licenses, and proposed disposal sites for technical acceptability. The contractor may not deviate from any aspect or clause of the contract without approval from DRMS. Other safeguards to ensure that hazardous wastes are disposed in an environmentally safe manner are tracking of wastes from

initial turn-in to ultimate disposal and the physical inspection of contractors operations to assure they are meeting the terms and conditions of the contract. [Ref. 1:p. 22]

An installation management directive of 1986 and its reaffirmation by the Assistant Secretary of Defense in 1989 allows base commanders who are not satisfied with the services provided by DRMS to contract for those services on their own. The service received must be equivalent to those of the DRMS contract and the parent service must be informed of intentions to do so. Additionally, the service must be provided at a better cost and with better quality and assurances than that of the DRMS contract. There has been little evidence of base commanding officers executing this option throughout the Navy and none in the San Diego area. The following benefits of DRMS contract utilization provide evidence as to why the base commanders have foregone the aforementioned option:

- 100% disposal contract support with no overhead charges to the DoD components.
- 100% manifest tracking to maintain an audit trail from initial turn-in to DRMO until final disposition.
- 100% monitoring of contractor performance at time of pickup through the DRMO employee serving as the Contracting Officer's Representative.
- Extensive technical evaluation of contractors prior to contract award and monitoring during performance of contract.
- Records of contractor performance histories maintained to evaluate performance.

- Reutilization/Transfer/Donation (R/T/D) and Sale of hazardous property and the potential to create new R/T/D and Sales alternatives.
- Capability to provide valuable contract cost and management data for individual installations and DoD components.
- Contracts are streamlined with standard contract provisions to ensure compliance with the Federal Acquisition Regulations and Federal, state, and local environmental regulations.
- Reduced contract costs because of geographic considerations and special contract designs.
- Contract requirements tailored to meet the customers' needs. [Ref. 1:p. 83]

The above benefits probably could not be achieved by any one installation due to economies of scale obtained through DRMS, and because most installations do not have the expertise and manpower necessary to execute such a program properly.

C. NAVY PUBLIC WORKS CENTER, SAN DIEGO, CALIFORNIA

PWC San Diego has played a key role in the evolutionary process of hazardous waste management in the San Diego area. They serve as a middle man between generators and DRMO regarding transportation of hazardous material between these two activities and they serve as the primary receiver, consolidator, storage facility, and ultimate disposer of hazardous wastes generated by Naval activities in this geographic area. The emphasis in this section will be placed on the function of PWC regarding hazardous waste rather than

their role as a transporter of hazardous material to DRMO for reutilization or sale.²

Facilities operated by PWC include two Treatment, Disposal and Storage Facilities (TDSF) and three satellite facilities. The TDSFs are located at Naval Air Station North Island (NASNI) and Naval Station San Diego (NAVSTA). Satellite facilities are located at Naval Air Station Miramar, Naval Air Facility El Centro, and Naval Submarine Base San Diego. The TDSFs are permitted by EPA to store hazardous waste for up to one year from the initial generation date and the satellite facilities are permitted by EPA to store hazardous waste for up to 90 days from the initial generation date. It should be noted that the TDSFs operated by PWC are only permitted to store and dispose of hazardous materials; they have not been permitted to treat this material in order to render it inert.

Generators have not been freed from their environmental responsibility because of PWC interaction but it has been lessened to a considerable extent. The generators are responsible for the proper labeling, completion of the profile sheet, and any laboratory analysis needed for identification of unknown wastes prior to loading on the PWC vehicle. PWC does not have a sufficient level of in-house knowledge and funding to provide this service at each local activity. Once the waste is accepted by the PWC representative, the

²Information in this section is a result of interviews with PWC San Diego personnel and personal observation.

responsibility and reliability for safe handling and storage transfers to them. At this point, PWC will make the appropriate determination regarding consolidation, storage, and ultimate disposal of the waste material.

Upon proper determination of which facility the waste should be transported to, PWC again reviews the associated paper work and processes the material according to EPA regulations. Storage, consolidation with previously collected wastes, or disposal to the DRMS contracted treatment and disposal facility is effected at this time.

Like DLA and its regional and field activities, PWC has been highly criticized for the exorbitant prices it charges customers. Because of their role as primary receiver of this waste in the San Diego area, they, rather than DLA, have been the center of focus for the Comptroller of both Commander, Naval Air Force, Pacific (CNAP), and Commander, Naval Surface Force, Pacific (CNSP). This is understandable because the generators are charged for waste disposal services through PWC rather than DLA or DRMO.

The rates charged by PWC are not a mere reflection of the rates established by the DRMS contract. They must capture the contracted rates and additionally, overhead must be allocated to cover PWC internal costs for labor, material and equipment. These are hidden costs to the generators utilizing the PWC service but they are costs that they would have to budget and absorb if they were to perform this function internally. [To

date, only Naval Amphibious Base Coronado has attempted to avoid the PWC rates by operating directly with DRMO and the contracted hazardous waste disposer. According to PWC, NAB has had limited success and is considering reverting to the use of the PWC service.]

Prior to Fiscal Year (FY) 1993, PWC used one flat rate for all wastes turned-in by generators. This created complaints because the flat rate was erroneous, misapplied, and actually resulted in profitable operations for PWC. For example, if an activity turned-in a 55 gallon drum of oily rags, PWC charged for a full drum even if the drum was only partially full.

This flat fee could not have possibly been a fair rate because the DRMS contracts generally cite 30 to 40 different fees based on waste types. Even the most astute analyst using sophisticated regression programming could not derive a fair price allocation using a flat fee formula. There are too many variable factors involved in the pricing equation and the waste stream data from previous years had been highly variable and unreliable as well.

PWC exhibited sensitivity to their customers complaints and has made earnest efforts to rectify the pricing inequities. Their first attempt at being more responsive came in FY 93 when they switched from the single volume rate to three rate structures based on actual poundage. This structure is reflected in Table 1. This has increased customer satisfaction because they now know exactly what and

how much waste they have turned-in and how much they will be charged for it.

TABLE 1

**PWC HAZARDOUS WASTE SERVICE CHARGES
FOR FISCAL YEAR 1993**

WASTE	COST PER POUND
Inorganic	\$3.00
Organic	\$2.50
Special ³	\$2.00

Although this pricing structure was received well by the customers of PWC, PWC has continued their commitment to providing quality service at a fair and reasonable price. A review conducted during 1993 has led to a further expanded structure for FY 94. As reflected in Table 2, there are now sixteen different categories of waste and PWC predicts that there will be a 15% to 25% decrease in costs to the generators. This is possible because of the broader base of wastes used for structuring and because the structure also takes into account the size of container turned-in. PWC again attempted to capture the true overhead costs associated with each waste stream.

³Special substances are wastes that could not be identified, are unusual, or the mixture does not fit the routine of an inorganic or organic substance.

TABLE 2
**PWC HAZARDOUS WASTE SERVICE CHARGES
FOR FISCAL YEAR 1994**

WASTE	COST PER POUND
Ignitable 1-5 G.	\$2.25
Corrosive 1-5 G.	\$1.35
Toxicity, Container/Bags	\$2.00
Ignitable 55 G.	\$1.90
Corrosive 55 G.	\$1.00
Reactive Waste	\$3.75
Plating Waste	\$2.85
Toxicity 55 G.	\$1.75
Solvent Liquid 1-5 G.	\$1.35
Solvent Liquid 55 G.	\$1.05
Solvent Solid 1-5 G.	\$2.50
Solvent Solid 55 G.	\$2.00
Oil 1-5 G.	\$1.00
Oil 55 G. Uncontaminated	\$0.50
Oil 55 G. Contaminated	\$1.50
PCB	\$2.20

D. FLEET INDUSTRIAL SUPPLY CENTER, SAN DIEGO, CALIFORNIA

FISC San Diego actively entered hazardous material management during 1993 with implementation of hazardous material reuse stores located at NASNI and NAVSTA. These stores operate in a unique manner and promise a potentially tremendous cost savings to the Navy regarding both procurement and disposal fees. Naval Supply Systems Command (NAVSUP)

funds this prototype program even though no direct benefits accrue to the FISC. The founding principle of the stores is based on the belief that the greatest potential for savings in the cost of hazardous waste disposal is to reduce the waste stream.⁴

The reuse store provides an alternative outlet to DRMO for activities in possession of hazardous material that is held in excess to their needs or is no longer needed. Unlike DRMO, the stores will accept material that is in rusted, dented or poorly labeled containers provided that it is in serviceable condition and can be properly identified. The generators can turn this material over to the store without any associated paper work. Turning the material in requires little more than making a telephone call to the store to inform them that it is available.

Upon receipt of material, store personnel inspect, catalogue, and store material on shelves or pallets. When the program was first initiated, some of the material received was actually hazardous waste due to expired shelf lives and various other reasons. The majority of the material received was in serviceable condition and thus enabled a successful initiation. Listings of available material are made available to the San Diego area customer base. Customers can review the

⁴Information in this section was obtained from a personal interview with FISC San Diego personnel and from personal observation of the Hazardous Material Reuse Store located at NAVSTA.

listing to identify any hazardous material needed by their command and obtain it free of charge. To draw the material they only need to make a telephone call to the appropriate store holding the material and it will be delivered to them by store personnel.

To further promote efficiency and economy, FISC queried customers for all hazardous material used in routine operations. This material is being added to the stores so that it too will be available for customers use and therefore provide a dis-incentive to requisitioning and stocking in the normal manner. Again, the same requisitioning procedures apply to this 'A' condition material as apply to the material turned in because of an excess condition. This material is not free-issue per se but the accounting for its cost is invisible to the customers. FISC simply informs the applicable comptroller of the requesting activity of any applicable charges and is then reimbursed.

Initial feedback from customers and personal observation indicate that this program will be a success. It has some flaws, such as lacking cradle-to-grave accountability over material once it is reissued, but, overall, it appears to be soundly founded and managed. More detail on projected reductions and savings is presented in Chapter III.

The efforts of FISC regarding hazardous material management do not stop with establishment of the reuse

centers. They have taken a proactive approach and intend to or are currently providing a number of other services such as:

- Conduct region-wide waste stream analysis.
- Establish shop towel/rag recycling contracts.
- Provide assistance with shelf life management.
- Conduct reviews to identify less hazardous substitute materials.
- Implement paint repackaging/reformulation services.

Continued commitment by FISC and NAVSUP in endeavors such as these promise further reduction of the hazardous waste stream and associated disposal costs.

III. DATA PRESENTATION AND ANALYSIS

Environmental awareness among DoD and Navy officials in the San Diego, California region, appears to have risen in the past few years. On-going actions demonstrate commitment to bring about positive changes to the way in which business is conducted. This chapter will examine the waste streams and associated costs generated in San Diego. It will analyze the minimization efforts and projected effects, and address hazardous waste treatment and/or abatement technology.

A. WASTE STREAMS AND ASSOCIATED COSTS

In-depth analysis of the waste stream is virtually precluded at this time due to deficiencies in reporting procedures. These procedures are complicated and often not clear to the personnel tasked with reporting. Efforts have been implemented by Naval Facilities Engineering Command to simplify these procedures commencing in FY 94; these efforts should enable collected data to properly represent hazardous waste generation and disposal data in the future.

Chart 1 in Appendix C reports hazardous waste collection data from selected San Diego activities and demonstrates some of the reporting inequities. Examination of these data reveals that some commands report material disposed, yet they report no disposal costs. Others report disposal costs, but

no material disposed, while other commands report what appear to be conflicting data between the tons of material disposed and disposal costs. Unreliability of this nature was found throughout the Hazardous Waste Summary Reports provided by Naval Facilities Engineering Support Command, Port Hueneme, California.

FISC San Diego utilized locally collected data from PWC and generated a general breakdown of the most common hazardous waste streams generated by several larger commands in the San Diego area (NAVSTA, NASNI, NAS Miramar, and Subase). Figure 1 displays the results of this analysis. This material accounts for over 1500 tons, or greater than 60% of the hazardous waste generated and turned in to PWC during 1992 by these activities. All of this material is of such a nature that it can be recycled, reformulated, sold, or treated.

Figure 2 provides the waste stream generation data of the same commands utilized in Figure 1 for CY 88 to 93.

By 1992, the waste stream generated has clearly more

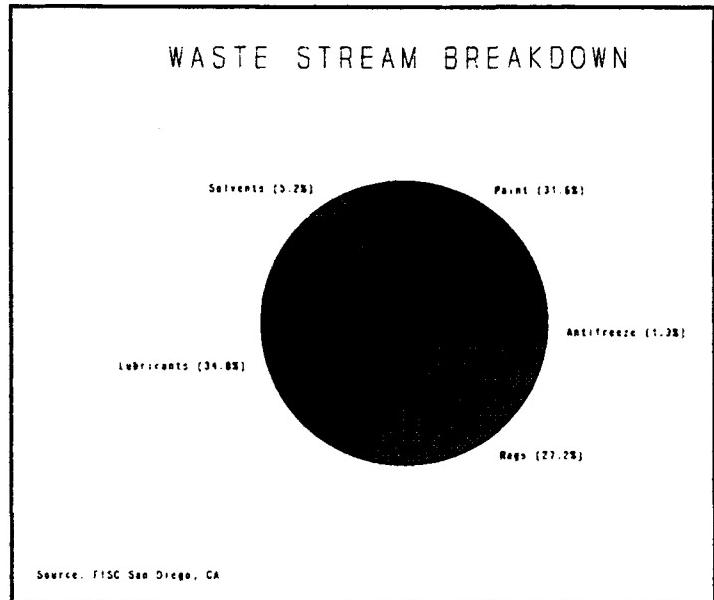


Figure 1

than doubled over that which was generated in 1988. This is an alarming trend and clearly is in violation of the mandate

to reduce generation levels by 50%.⁵ There are a number of possible reasons why this trend has occurred. The most logical of which is the changing scenario in the post cold war era.

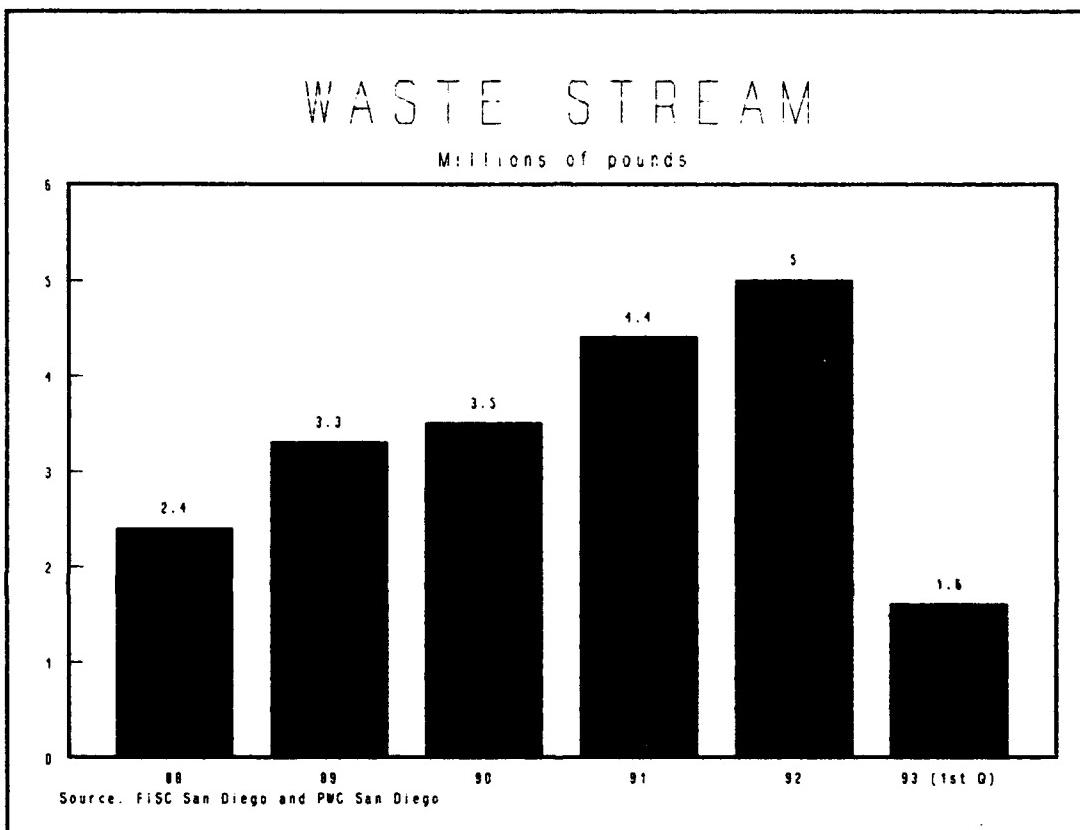


Figure 2

The end of the Soviet Union threat to United States interests has caused a massive rethinking regarding national strategy. This shift in strategy calls for a down-sized

⁵Data presented in Appendix C and data in Figures 1 and 2 is not the same because selected activities were used in both cases.

military in both personnel, facilities and equipment. Navy vessels have been decommissioned in the San Diego area in support of these efforts. Actions of this nature result in generation of increased hazardous waste streams that otherwise would not have been generated in such great magnitude.

Another contributing factor to this growth is perhaps related to the increased interest in hazardous waste minimization and compliance efforts by installation commanding officers. Much of this interest is attributable to DoD and Navy policy and to increased regulatory pressure from local, regional and state governments. Efforts to minimize the risk of non-compliance may in effect increase the elimination of unwanted and expired stores, thereby increasing waste generation. Additionally, personnel involved with hazardous waste handling may be treating certain non-hazardous wastes as hazardous wastes to further safeguard the installation and the commander from an EPA violation. An example of this is disposing of an empty paint can with hardened residue as waste rather than as trash.

Appendix C, Chart 2, presents selected accounting data from CNAP and CNSP activities in the San Diego area for environmental expenditures. Appendix D provides a brief description of the uses for the applicable sub-accounting groups (SAG) within the accounting group (AG). Examination of these data indicates that expenditures for shore environmental protection have decreased over the last three fiscal years.

This is not a good trend because it is these funds that could be used for implementation of various endeavors to further reduce long term hazardous waste costs. An example of this is an environmental impact study associated with the application and permitting process needed to implement waste treatment technology. These funds also could be utilized to improve existing facilities so as to lessen the risk associated with improper handling, storage, and processing of the wastes. Currently, only class 1 and 2 projects are funded because they are the most critical and would result in a fine if not corrected. Appendix E provides a description of project classifications.

As may be expected, expenditures for disposal and other non-disposal hazardous waste operations have increased significantly because of the increase in waste generation and disposal. The increase in this SAG directly impacts the ability to funnel funds into protective measures. As long as disposal generation is on the rise, this phenomenon will not abate. More funds must be allocated through the budget process to adequately fund shortfalls in environmental protection expenditures.

B. HAZARDOUS MATERIAL AND WASTE MINIMIZATION

As discussed in the previous section, the generation of hazardous waste has actually risen vice declined due to a possible myriad assortment of reasons. Current efforts by

FISC to combat and minimize this problem project potential cost savings and reduction of waste. These efforts will be bolstered further by the efforts of individual commands to establish proper requisitioning and control procedures. Clearly though, the efforts of FISC promise the most widespread effect in these endeavors. The projected savings as determined by FISC are presented below.

**PROJECTED SAVINGS OF FISC SAN DIEGO
HAZARDOUS WASTE MINIMIZATION PROGRAM
(000's)**

	<u>FY 95</u>	<u>FY 96</u>	<u>FY 97</u>	<u>FY 98</u>	<u>FY 99</u>
Reutilization	\$1,000	\$1,300	\$1,300	\$1,300	\$1,300
Inventory Inv.	500	400	100	0	0
Waste Reduction	2,000	6,000	7,000	7,000	8,000
Shelf Life	300	300	300	300	300
Personnel	350	350	500	500	500
Recycling	250	250	250	250	250
Regulatory Comp.	250	400	400	400	400
Subtotal	\$4,650	\$9,000	\$9,850	\$9,750	\$10,750
Cost	1,250	1,500	1,750	1,750	1,750
Total Savings	<u>\$3,400</u>	<u>\$7,500</u>	<u>\$8,100</u>	<u>\$8,000</u>	<u>\$9,000</u>

Definitions of the above programs are as follows:

- Reutilization: Savings associated with Re-use Store operations (cost avoidance for free issue material and disposal cost avoidance).
- Inventory Investment: Reduction of stock funded inventories in area.
- Waste Reduction: Reduced area hazardous waste disposal costs due to hazardous material program initiatives.
- Shelf Life: Waste disposal cost reductions associated with area shelf life management.

- Personnel: Savings associated with consolidated hazardous material management versus stovepipe operations (military and civilian costs).
- Recycling: Savings generated through implementation of regional consolidated projects.
- Regulatory Compliance: Savings on potential fines to base activities resulting from comprehensive hazardous material management.⁶

Not all of the savings projected by FISC will be a direct reduction to the hazardous waste accounting group account of the area comptrollers, but a significant portion of those savings will be shared by all. The net savings in the entire region are substantial and should allow for increased spending in the shore environmental protection sub-accounting group (SAG FX). This in turn should realize increased savings and a safer working environment.

The implementation cost incurred by FISC for establishing this program was \$1.2 million. The projected \$36 million savings (FY 95 to FY 99) indicate a good potential for long term savings thereby making this a fruitful investment. Commitment and cooperation between all parties should ensure a successful project that produces a substantial cost savings and helps to ensure regulatory compliance.

⁶Source: FISC briefing paper on "San Diego Regional Hazmat Program Cost/Savings Analysis".

C. WASTE TREATMENT TECHNOLOGY

Regulatory uncertainty discourages private investment in regional waste treatment centers that could render most hazardous wastes generated in the region inert, nonleachable and nonhazardous. Typical investment required for a regional treatment facility using Fujibeton technology is in the range of \$750,000 to \$1,500,000. This facility could render nonhazardous virtually all inorganic waste and most organic waste. [Ref. 4:p.64]

The above statement of Jefferey Newton, President, New Materials Technology Corporation, before a hearing of the House of Representatives on hazardous waste treatment technology was echoed by virtually every person testifying before the Committee on Science and Technology. Costs cited cannot be verified since the statement was made in 1985 and there have been many changes in environmental regulation and also in costs due to inflation. His remarks do have merit, however, and they point to perhaps one of the biggest deficiencies within the federal government, DoD, and the Navy. That deficiency is the lack of investment in exploring, developing and using currently existing advanced waste treatment technologies to reduce the cost of hazardous waste disposal by treating hazardous waste in-house.

In the past, this area was off limits to DoD and the Navy for several reasons, the most prominent of which are: federal regulations that forbid joint ventures between the government and private industry where industry will benefit unfairly because of government investment; lack of financial resources

in the DoD budget; prohibitive EPA regulations. The last two reasons are still valid today, but it appears that they must change to meet the requirements of Executive Order 12856, enacted by President William J. Clinton on August 3, 1993. The subject of this Executive Order is "Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements".

Whereas, the Federal Government should become a leader in the field of pollution prevention through the management of its facilities, its acquisition practices, and in supporting the development of innovative pollution prevention programs and technologies;...

Whereas, as the largest single consumer in the Nation, the Federal Government has the opportunity to realize significant economic as well as environmental benefits of pollution prevention;...

Help encourage markets for clean technologies and safe alternatives to extremely hazardous substances or toxic chemicals through revisions to specifications and standards, the acquisition and procurement process, and the testing of innovative pollution prevention technologies at Federal facilities or in acquisitions;

-Executive Order 12856

It appears that federal regulations barring joint ventures between government and industry regarding development of pollution treatment and abatement technologies must now be changed. This alone will not suffice. Proper funding must also be budgeted through the DoD/DoN budgeting system to allow for this type of venture. DoD and the Navy must aggressively plan and pursue funding for these actions and Congress must be attentive to their needs. In the past, this has not been the

case on either part. For example, the proposed Naval Facilities Engineering Command FY 94 Shore Based Environmental Research and Development Program is currently obsolete due to budget cuts. This plan was aggressive in nature and would have funded numerous projects in the fields of pollution prevention and treatment. Had financial constraints not curtailed these endeavors, technologies of benefit to the Navy, DoD, and industry might have otherwise been experimented with and adopted. These benefits would equate to a possible cost savings and an improved environment.

The amount of technology currently in existence but not utilized is substantial. The San Diego area is home to many Navy and DoD installations, many of which perform industrial type activities that produce vast quantities of hazardous waste. These facilities are prime proving and testing grounds for developed and experimental technology. Not all will pan out, but certainly there is existing or emerging technology that will effectively combat the escalating costs of hazardous waste treatment and disposal. With proper funding for research and development and the appropriate change in EPA regulations, these technologies can be developed for the betterment of the Navy, DoD and society.

IV. CONCLUSION

A. OVERVIEW

The initiatives of the Joint Logistics Commanders in 1986 mark the beginning of top management commitment within DoD to the issue of pollution abatement and control. Navy officials later adopted this goal and have instilled it throughout all their commands. Naval installations and commands in the San Diego area are proactively implementing measures necessary to promote a safe and clean environment. Their efforts indicate potential cost savings, efficiencies, and a safer environment. These actions alone are not enough; more can and must be done locally and within DoD and the Navy.

FISC's hazardous waste minimization program and re-use stores promote environmentally sound practices in both use and procurement of hazardous materials. This program projects a great potential cost savings that will be shared by all area commands. If the projected savings prove to be true, they should help to curb the spiraling costs incurred by financial managers on environmental spending. Success of the program is dependent on judicious use of hazardous materials; that is, costs will be reduced the greatest if hazardous material use is lessened through more economical use or by substitution of a less or nonhazardous substitute.

Efforts within DoD and the Navy to identify less hazardous or nonhazardous substitutes must be a top priority. The Navy system commands have been tasked to initiate this endeavor but, there have been relatively few gains in this area. These commands are responsible for generation of maintenance requirement standards and specification of materials needed for its accomplishment. Personnel involved with actual performance of the maintenance may be the best source to initiate investigative action to identify possible substitutes and, therefore, should be solicited and encouraged to provide feedback to the system commands regarding this matter.

Greater emphasis must be placed on the training of all personnel in the safe and proper use of hazardous materials. Proper training will ensure economical use and safe handling of these materials, thereby allowing cost savings from the minimized use of the material and by avoiding potential accidents and spills that result in costly clean-up efforts. This training should be conducted up front in the accession programs for military and civilian personnel.

Exploitation and use of better technology to render hazardous waste inert must be investigated and implemented when possible. Establishment of an all purpose single hazardous waste treatment facility in San Diego is probably not economically or politically feasible at present but, limited treatment technologies may be viable at existing facilities in the San Diego region. Technologies such as

fujibeton, an advanced form of cement powder that is blended with toxic materials to render them inert, merit consideration for use. This type of technology could significantly reduce the spiraling disposal costs incurred by financial managers today. [Ref. 4:p. 63]

Some other technologies are super critical water oxidation, incineration, chemical treatment, conversion of hazardous waste to alternative energy sources, development of high efficiency spray equipment for application of low volatile organic compound coatings, development of alternative paint technologies, and development of recycling technology for abrasive blasting materials. These technologies should be pursued if DoD and the Navy hope to reduce hazardous waste disposal costs in an effective and efficient manner.

B. AREAS FOR FURTHER RESEARCH

Compliance with environmental regulations is necessary and costly. Realization of cost savings in this area is not easy, but can be achieved through active participation by all commands, support activities, and personnel at all levels. There is no outside entity to rely on for a quick fix or easy answer; the Navy and DoD must look inward and take the necessary steps to make environmentally and economically sound decisions.

Further research may be considered in the following areas:

- Use linear regression to analyze the cost drivers incurred by PWC in dealing with hazardous waste management to enhance the existing hazardous waste disposal pricing structure.
- Identify specific existing sites in the San Diego area, hazardous waste treatment technologies that could be utilized at these facilities, and the costs associated with these technologies. NASNI or NAVSTA appear to have the most potential for this type of endeavor.

C. SUMMARY

There are no absolutes in dealing with the environment; however, environmental pollution is caused by a waste. Therefore, the most environmentally sound decision is to not create the waste in the first place. Waste treatment and management is inherently inefficient and costly. To minimize costs, waste must be prevented rather than controlled. Prevention needs to be accomplished through tough management and minimization programs, through education and training, through use of less or non-hazardous substitutes, and through development of technologies that can render hazardous waste inert.

APPENDIX A

Acronyms

AG	Accounting Group
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFCs	Chlorofluorocarbons
CNAP	Commander, Naval Air Force, Pacific
CNSP	Commander, Naval Surface Force, Pacific
CWA	Clean Water Act
DASD(E)	Deputy Assistant Secretary of Defense (Environment)
DLA	Defense Logistics Agency
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
DRMS	Defense Reutilization and Marketing Service
EPA	Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FISC	Fleet Industrial Supply Center
NAAQS	National Ambient Air Quality Standards
NASNI	Naval Air Station North Island
NAVSTA	Naval Station San Diego
NAVSUP	Naval Supply Systems Command
NEPA	National Environmental Policy Act
OSD	Office of the Secretary of Defense

PCB	Polychlorinated biphenyls
PWC	Public Works Center
RCRA	Resource Conservation and Recovery Act
SAG	Sub-accounting Group
SARA	Superfund Amendments and Reauthorization Act
SIP	State Implementation Plan
TDSF	Treatment, Disposal and Storage Facility
TSCA	Toxic Substance Control Act

APPENDIX B

- **Clean Air Act (CAA) of 1970 as amended through 1977-** requires prevention or control and abatement of air pollution from stationary and mobile sources; requires EPA to set binding National Ambient Air Quality Standards (NAAQS). Air quality standards are achieved by the states through plans (State Implementation Plans - SIP's), they are tailored to meet the needs of the different air quality control regions. Navy installations are subject to federal, state, and local air pollution control requirements. [Ref. 5]
- **Clean Water Act (CWA) of 1972, as amended through 1987-** regulates discharge of pollutants into waters of the United States from any point source including industrial facilities and sewage treatment facilities; requires permits for discharges; requires reporting and clean-up of oil and hazardous substance spills in waterways; also protects waterways and requires a permit to adversely affect wetlands. The Navy has a more stringent policy requiring no-net-loss of wetlands, meaning wetlands must be created to replace any which are destroyed, whether by filling or draining. [Ref. 5]
- **Resource Conservation and Recovery Act (RCRA), as amended through 1986-** regulates waste handling activities and the generation, transport, treatment, storage and disposal of hazardous wastes; allows the EPA to take action against persons conducting past or present activities that present an imminent or substantial endangerment to health or to the environment; provides for corrective actions against contamination resulting from past releases of hazardous wastes even without an imminent hazard; mandates all branches of the federal government to comply with solid waste and hazardous waste requirements. [Ref. 6:p. 192]
- **Toxic Substances Control Act (TSCA) of 1976-** empowers EPA to collect information and regulate toxic chemicals at any stage from manufacture through disposal; regulates polychlorinated biphenyls (PCBs), chlorofluorocarbons (CFCs), and asbestos as well as others; requires testing of chemical substances entering the environment, regulating releases where necessary. Allows EPA to prohibit manufacture, limit production, ban or control the

use of toxic chemicals to protect public health. TSCA authority may not be delegated to states. [Ref. 5]

- **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**- authorizes the federal government to clean up toxic or hazardous contaminants at closed and abandoned hazardous waste dumps; permits the government to recover the cost of the cleanup and associated damages by suing the responsible parties involved; allows additional cleanup funds to be drawn from a "superfund" created by taxes on chemicals and hazardous wastes; places liability for the costs of containment, removal, remedial action and response, and for injury damages to natural resources on the parties who operate the vessel or facility when there is a release of a hazardous substance. [Ref. 6:p. 194]
- **Superfund Amendments and Reauthorization Act (SARA)**- amends CERCLA and provides mandatory schedules for the completion of various phases of remedial response activities; established detailed cleanup standards and strengthened existing authority to effect the cleanup of superfund sites. [Ref. 6:p. 195]
- **Safe Drinking Water Act (SDWA) of 1974**- regulates drinking water quality for pollutants that may have an adverse effect on human health or negatively effect the aesthetic quality of drinking water. Protects underground sources of water by regulating the underground injection of wastes and requires states to have plans to protect well field areas from contaminants. [Ref. 5]
- **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1972**- requires the licensing or registration of pesticide products; requires proper management of pesticide use, storage, and disposal. [Ref. 5]
- **Endangered Species Act of 1973 as amended**- requires that actions of Federal agencies do not jeopardize the existence of threatened or endangered species or destroy or adversely impact critical habitats of these species. [Ref. 5]
- **Sikes Act**- requires military installations to manage their national resources and provide public access for natural resource use that is consistent with the military mission. [Ref. 5]
- **Emergency Planning and Community Right-to-Know Act of 1986**- provides local governments information concerning possible chemical hazards in the community; requires

emergency planning for releases of extremely hazardous substances. [Ref. 5]

- **Executive Order 12088**- link between Federal environmental regulations and Federal facilities; requires Federal facilities leadership in furthering the purpose and policies and monitoring of environmental pollution in compliance with Federal environmental regulations (signed October 13, 1978). [Ref. 5]

APPENDIX C

DATA TABLES

There are two sets of data:

1. HAZARDOUS WASTE COLLECTION DATA FROM SELECTED SAN DIEGO ACTIVITIES.
2. FY 91-93 ACCOUNTING GROUP E4 EXPENDITURES.

HAZARDOUS WASTE COLLECTION DATA FROM SELECTED SAN DIEGO ACTIVITIES

CY90

UIC	ACTIVITY	TONS DISPOSED	DISPOSAL COSTS
N00244	FISC SAN DIEGO CA	5.81	\$42,059
N00245	NAVSTA SAN DIEGO CA	470.98	52,000
N00246	NAS NORTH IS SAN DIEGO CA	351.19	870,230
N00247	NTC SAN DIEGO CA	12.74	38,000
N00259	NAVAL HOSPITAL SAN DIEGO CA	10.03	13,219
N00948	FLEASWTRACENPAC SAN DIEGO CA	0.00	7,600
N60042	NAF EL CENTRO CA	160.00	33,239
N61665	FLECOMBATRACENPAC SAN DIEGO CA	0.00	627
N61690	FLETRACEN SAN DIEGO CA	29.08	0
N60259	NAS MIRAMAR CA	6.00	673,000
N62021	NAB CORONADO CA	2.00	397,000
N63387	PWC SAN DIEGO CA	418.12	0
N63406	SUBASE SAN DIEGO CA	314.64	21,000
N65584	NAVELEXSYSENGcen SAN DIEGO CA	3.78	5,800
N65888	NAVANVDEPOT NASNI SAN DIEGO CA	686.71	757,214
N65918	SIMA SAN DIEGO CA	39.84	64,995
N66001	NAVOCEANSYSSEN SAN DIEGO CA	32.64	128,628
N70240	NAVCOMMSTA SAN DIEGO CA	0.00	5,606
CY90 TOTAL		2543.56	\$3,110,219

CY91

N00246	NAS NORTH IS SAN DIEGO CA	461.9	1,340,000
N00247	NTC SAN DIEGO CA	16.24	46,728
N00259	NAVAL HOSPITAL SAN DIEGO CA	3.1	28,009
N00948	FLEASWTRACENPAC SAN DIEGO CA	2.09	12,440
N60042	NAF EL CENTRO CA	73	124,177
N61665	FLECOMBATRACENPAC SAN DIEGO CA	0	1,230
N61690	FLETRACEN SAN DIEGO CA	33.93	0
N60259	NAS MIRAMAR CA	342	607,686
N62791	SUPSHIP SAN DIEGO CA	3.95	7,330
N63387	PWC SAN DIEGO CA	924.11	4,242,000
N63406	SUBASE SAN DIEGO CA	259.08	680,104
N65584	NAVELEXSYSENGcen SAN DIEGO CA	7.87	8,000
N65888	NAVANVDEPOT NASNI SAN DIEGO CA	562.75	1,238,735
N65918	SIMA SAN DIEGO CA	110.86	59,863
N66001	NAVOCEANSYSSEN SAN DIEGO CA	23.25	238,900
N70240	NAVCOMMSTA SAN DIEGO CA	0	6,000
CY91 TOTAL		2824.13	\$8,641,202

CY92

N00245	NAVSTA SAN DIEGO CA	1019.37	2,245,916
N00246	NAS NORTH IS SAN DIEGO CA	343.92	1,390,000
N00247	NTC SAN DIEGO CA	412.65	56,728
N00259	NAVAL HOSPITAL SAN DIEGO CA	5.74	20,780
N39233	NEX NAVSTA SAN DIEGO CA	14.96	0
N60042	NAF EL CENTRO CA	163	128,492
N61665	FLECOMBATRACENPAC SAN DIEGO CA	2.42	5,800
N61690	FLETRACEN SAN DIEGO CA	44.44	0
N60259	NAS MIRAMAR CA	393	1,408,094
N62791	SUPSHIP SAN DIEGO CA	2.88	11,942
N63387	PWC SAN DIEGO CA	234.66	5,293,686
N63406	SUBASE SAN DIEGO CA	102.17	750,772
N65888	NAVANVDEPOT NASNI SAN DIEGO CA	461.94	1,790,904
N65918	SIMA SAN DIEGO CA	134.47	190,000
N66001	NAVOCEANSYSSEN SAN DIEGO CA	106.64	446,000
N68944	NISE WEST SAN DIEGO CA	1.56	9,500
CY92 TOTAL		3443.82	\$13,748,614

FY 91-93 ACCOUNTING GROUP E4 EXPENDITURES

SAG FT:

ACTIVITY	FY 91	FY 92	FY93	TOTAL
NAS NORTH ISLAND	\$1,398,241	\$1,312,372	\$1,030,000	\$3,740,613
CNAP	179,933	310,331	1,473,000	1,963,264
NAF EL CENTRO	149,891	112,732	656,000	918,623
NAS MIRAMAR	1,227,104	2,169,627	2,685,000	6,081,731
NS SAN DIEGO	1,326,000	564,000	1,177,000	3,067,000
NAB CORONADO	575,000	838,000	451,000	1,864,000
SIMA SAN DIEGO	190,000	220,000	554,000	964,000
OPFORCES SHIPS	2,733,000	6,661,000	8,071,000	17,465,000
TOTAL	\$7,779,169	\$12,188,062	\$16,097,000	\$36,064,231

SAG FX:

ACTIVITY	FY 91	FY 92	FY93	TOTAL
NAS NORTH ISLAND	\$1,171,113	\$1,187,590	\$1,796,000	\$4,154,703
CNAP	0	0	60,000	60,000
NAF EL CENTRO	0	29,733	133,000	162,733
NAS MIRAMAR	1,795,943	571,622	1,234,000	3,601,565
NS SAN DIEGO	308,000	371,000	527,000	1,206,000
NAB CORONADO	1,048,000	328,000	440,000	1,816,000
SIMA SAN DIEGO	0	0	32	32
OPFORCES SHIPS	0	0	0	0
TOTAL	<b">\$4,323,056</b">	\$2,487,945	\$4,190,032	\$11,001,033

AG E4 GRAND TOTAL \$12,102,225 \$14,676,007 \$20,287,032 \$47,065,264

APPENDIX D

AG/SAG E4FT: HAZARDOUS WASTE

Provides for:

- Hazardous Waste Disposal
- Other Non-disposal Hazardous Operations

Includes:

- Determination of the chemical and physical nature of waste
- Receipt
- Testing
- Inspection
- Issue
- Transportation
- Disposal
- Training of personnel that handle hazardous waste
- Development of contingency plans
- Hazardous waste management
- Operation of facilities for storage, treatment or disposal of hazardous waste

AG/SAG E4FX: SHORE ENVIRONMENTAL PROTECTION

Provides for:

- Environmental engineering management
- Permits
- Fees
- Fines
- Litigation
- Engineering Studies (including NEPA documentation)
- Minor alterations to facilities and equipment not centrally funded

Does not include:

- Routine costs associated with utility operations and maintenance, such as sewage or water treatment plants

APPENDIX E

<u>Project Classification</u>	<u>Description</u>
1a	Projects needed to support signed compliance agreement or to correct conditions for which a facility has been cited by government, agency, etcetera.
1b	Projects required to correct noncompliant conditions identified by the facility or internal Navy or DoD review or audit.
2a	Projects for facilities which do not meet established standards, but compliance deadline is in the future.
2b	Projects for facilities where there is a pending standard that cannot be met and the compliance deadline is in the future.
3a	Facility meets established standard but needs replacement because of obsolescence.
3b	Facility meets established standard but needs expansion or will go out of compliance.
3c	Facility meets established standard but project is needed for other than compliance reasons. Will demonstrate leadership.
3d	Other reason not falling in categories above.

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